

Digital scale-up and optimization of animal cell cultures

Cell culture engineering principles. Kinetic analysis. Knowledge simulation models. Digital optimization of batch, fed-batch and perfusion culture bioreactors

ONLINE COURSE

On-demand

COURSE FEE

350 € per session

COURSE ORGANIZATION

Course divided in 8 sessions

Sessions can be taken individually

Session scheduling: suggested one per week

Effort: 4 - 8 h per session

COURSE DESCRIPTION

The course provides a comprehensive overview of the concepts and methodologies of bioprocess engineering for the digital design and optimization of animal cell culture bioreactors. It covers cell culture kinetics, oxygen transfer in bioreactors, the development of knowledge-driven simulation models, the scale-up and optimal operations of batch, fed-batch and continuous perfusion cultures. The course combines methodological review presentations with a case study on cells or antibodies production.

INSTRUCTOR

Jean-Marc ENGASSER, BioProcess Digital

DIGITAL LEARNING

- Learning platform with course resources
- Live or recorded slideshow videos
- Case studies on spreadsheets templates with guides
- Online collective or one-to-one tutoring

COURSE PROGRAM

Session 1: Cells cultures engineering principles

Cells cultures governing phenomena. Mass balances in bioreactors. Mass transfer in bioreactors.

Session 2: Kinetics of cells cultures

Animal cells kinetics. Kinetic analysis of cell growth, death and metabolism at the laboratory

Session 3: Oxygen consumption and transfer kinetics

Kinetic analysis of oxygen transfer and cellular consumption. Oxygen solubility and transfer rate laws

Session 4: Cell culture bioreactor simulation model

Simulation model mass balances and kinetics at laboratory scale. Model construction on spreadsheet

Session 5: Batch bioreactor scale-up and optimal operation

Bioreactor simulation model scale-up. CO₂ production and transfer modeling. Batch culture optimization

Session 6: Fed-batch bioreactor scale-up and optimal operation

Fed-batch bioreactor principle and operational variables. Fed-batch culture simulation and digital optimization

Session 7: Perfusion bioreactor scale-up and optimal operation

Perfusion bioreactor principle and operational variables. Perfusion culture simulation and digital optimization

Session 8: Sensitivity and uncertainty analysis of digital scale-up

Cell cultures sensitivity analysis: most influential operational variables. Uncertainties of simulation model predictions